

八十五學年度國立台灣工業技術學院研究所碩士班招生考試

所別：機械工程技術研究所

組別：固力與設計、製造、熱流、控制、材料組 科目：工程數學

1. Find the general solution of $x^2 y'' - 2xy' + 2y = x^3 \cos x$ (15%)

2. Solve the differential-integral equation $y' + \int_0^t y(\alpha) \cos 2(t-\alpha) d\alpha = \delta(t-3)$, $y(0)=1$ (15%)

3. Find the flux of $\vec{F} = x\vec{i} + y\vec{j} + z\vec{k}$ across the part of the sphere $x^2 + y^2 + z^2 = 4$ lying above the plane $z=1$ (15%)

4. Find the standard form of the quadratic form $4x_1^2 - 3x_1x_2 + 2x_2^2$. Also find the transformation matrix between this quadratic form and its standard form. (15%)

5. Apply the residue theorem to evaluate $\int_0^{2\pi} \frac{\cos 2\theta}{1-2p \cos \theta + p^2} d\theta$ where $p > 1$ (20%)

6. Solve the partial differential equation $\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2} + h \frac{\partial u}{\partial x}$ ($0 < x < L, t > 0$)
 $u(0, t) = u(L, t) = 0$ ($t > 0$)
 $u(x, 0) = f(x)$ ($0 < x < L$) (20%)

